

Oral Cavity

21

(17)

• Vestibule of mouth

= space bet. inner side of lips & cheeks & outer side of gums & teeth.

• Oral Cavity: lined e' oral mucosa =

a) Epith. = st. sq. epith.

b) Lamina propria = c.t. rich in bl. vs, nerves, lymph vs & minor salivary gls.

In soft palate, floor of mouth & inner side of cheeks: the epith. is non-keratinized & connected to underlying tissue by loose c.t.

In Hard palate & gingiva (gums): the epith. is Keratinized & tightly bound to the periosteum by dense c.t.

1 The Lips

= Skeletal muscles (Orbicularis Oris) arranged circumoral mixed e' dense c.t.

Outer surface (skin)

epidermis Keratinized st. sq. epith.
c.t. dermis contains: hair follicles, sweat & sebaceous glands.

Inner surface (oral mucosa)

epith: non-kerat. st. sq.
c.t. rich in bl. vs., ns., lymph vs + labial gl
but No sweat, seb gls or hair follicles.

* Labial gland = tubulo-alveolar minor salivary gls. = mostly mucous acini e' occasional serous acini.

The Red line (margin) = (Vermilion)

A transition zone bet. outer skin & inner mucous memb. = modified skin e' no hairs. It is transparent so show the red colour of underlying bl. vs. It is rich in sensory ns so highly sensitive. There is no sweat or sebaceous gls → so needs continuous wetting by saliva to prevent cracking.

2. The Cheeks

= skeletal ms = Buccinator

• Outer surface = skin e' subcutaneous c.t.

• Inner " " = Oral mucosa e' mucoserous salivary gls = Buccal gls in c.t.

3. The tongue

= skeletal ms. arranged in 3 directions at right angles ^{longitudinal} ^{vertical} ^{horizontal} to ensure high degree of mobility for mastication, speech & swallowing

* the mucous memb. on dorsal surface:

- rough due to presence of lingual papillae on ant. $\frac{2}{3}$ & lingual tonsil on post. $\frac{1}{3}$.
- covered e' partially Keratinized st. sq. epith e' papillated lamina propria.
- thick & firmly adherent.

* the mucous memb. on Ventral surface:

- smooth, thin, loosely adherent, no lingual papillae
- covered e' non-keratinized st. sq. epith.
- lingual gls are embedded in c.t. & bet. ms. of vent. surface.
seromucous glands.

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Lingual Papillae

def.: Elevations of the oral mucosa (epith. & lamina propria) of the ant. 2/3 of the dorsum of tongue.

4 types:

	Filiform	Fungiform	Circumvallate	Foliate papillae
shape	Conical & slightly curved	Mushroom like i.e. narrow base & wide upper part	narrow base & broad top not projecting on surface surrounded by circ. furrow (valley) sulcus	2 or more parallel ridges & furrows of c.t. covered e' non-Ker. st. sq. epith.
site	ant. 2/3 of dorsal surface of tongue	edges & tip of tongue & scattered bet. Filiform	V-shaped region in front of sulcus terminalis	On dorso lat. surface of tongue of rabbit, monkeys & other animals but
No	most numerous	less numerous (scattered)	least common 6-14	poorly developed in humans
taste buds	No	some	many on its sides	many
sp. character	Covered e' Kerat. st. sq. epith whitish in colour	Non-Kerat. epith C.t. is rich in bl. vs ↓ red appearance	presence of <u>Von Ebner's glands</u> = serous gls just under & open into the grooves surrounding the papillae → continuous flow of fluids over the taste buds	Serous glands open by ducts to discharge their secretion into the clefts separating the papillae

Taste buds:

- Onion shaped neuroepithelial structures. Have wide bases & narrow apices w have a small opening = taste pore.
- specialized to receive taste stimuli: saltiness, sourness, sweetness & bitterness
- Sites: 1. Tongue papillae: circumvallate, fungiform & foliate papillae
2. soft palate, 3. pharynx 4. Epiglottis.
- Formed of three types of cells:

1. Pale Gustatory (taste) Neuroepith. cells:

- pale elongated centrally located cells e' central nuclei
- have apical long processes many times $>$ microvilli in diameter.
- their basal parts contain dense core vesicles containing neurotransmitters.
- " " " are surrounded by naked nerve fs. to carry taste sensat.

2. Dark Sustentacular (supporting) Cells:

- tall dark cells at the periphery & interior of the taste bud e' central nuclei
- have long apical microvilli projecting into the taste pore.
- Secrete glycoprotein material that surround the microvilli in the taste pore

3. Basal Cells:

- At the base of the taste bud
- Act as stem cells for renewal of taste cells & supporting cells.

Glands of the tongue:

1. lingual glands: seromucous gls w open on the vent. surface of the tip of tongue
2. Von Ebner's gls: Serous gl. just under & open into sulci (valley) around the circumvallate papillae.
3. Mucous & mixed gls: in dorsum of tongue.

The Palate

Hard Palate

- ant. part of roof of oral cavity
- covered e' Keratinized st. sq. epith + lamina propria of c.t.
- the mucosa is firmly bound to periosteum of maxilla & palatine bone by dense c.t.

Soft palate

- post. part of roof of oral cavity
- covered e'
 - ↳ ant. oral part = oral = Non-Kerat. st. sq. mucosa
 - ↳ post. margin - continuous e' nasal cavity
 - resp. mucosa = ps. st. col. cil e' goblet cells
- has a core of skeletal muscles + mucous gls + lymph follicles.

Oesophagus

Formed of 4 layers:

1. Mucosa : consists of:

a] Epithelium = non-Keratinized stratified squamous
protect against rough food.

b] lamina propria = loose c.t. + simple tubular mucous gls = Cardiac gland

c] Muscularis mucosa ^[thin] = smooth muscles in 2 layers: inner circ. & outer long.

2. Submucosa :

- loose c.t. rich in bl. vs, lymph vessels & Meissner's plexus of nerves
- contains Oesophageal glands = compound tubulo-alveolar mucous glands
- their ducts open on the surface to protect the mucosa.

3. Musculosa :

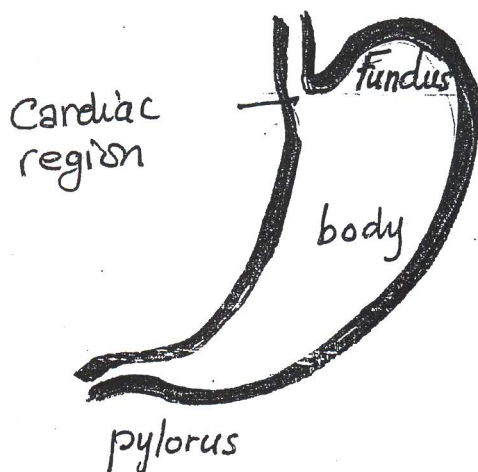
- Formed of inner circ & out. long. layers. In $\left\{ \begin{array}{l} \text{upper } \frac{1}{3} \rightarrow \text{skeletal} \\ \text{middle } \frac{1}{3} \rightarrow \text{mixed} \\ \text{lower } \frac{1}{3} \rightarrow \text{smooth} \end{array} \right. \left\{ \begin{array}{l} \text{skeletal} \\ \text{smooth} \end{array} \right.$

4. Adventitia :

loose c.t. w connect the oesoph. & surroundings
under the diaphragm it is replaced by serosa.

Stomach

The cardiac region : the glands are lined by mucous secreting cells.
Fundus & body : have same histological structure



Fundus of Stomach

1. Mucosa :

Thick, dark & highly folded (rugae), in full stomach these long folds disappear
formed of:

- a. Epithelium : mucous surface cells: الجدار
- b. Lamina propria : = loose c.t. containing fundic glands.
- c. muscularis mucosa : smooth muscles arranged as inner circ & out. long

Characters of Fundic Glands

- Simple branched tubular gland
- Occupy most of the thickness of mucosa.
- perpendicular to the surface.
- highly crowded with little c.t. in between.
- Open on the surface by narrow & short pits (ducts)
the ratio between the pit & gland 1:3 or 1:4
- Formed of isthmus, neck & body (base)
- lined by 6 types of cells: الجدار

2. Submucosa :

loose c.t. rich in bl. vs, lymph vs & Meissner's plexus of nerves.

3. Musculosa :

- Smooth muscles in 3 layers $\left\{ \begin{array}{l} \text{inner oblique.} \\ \text{middle circular.} \\ \text{outer longitudinal.} \end{array} \right.$
- Auerbach's plexus of nerves is present bet. the circ. & long. muscle layers to regulate peristaltic movement.

4. Serosa : loose c.t. covered by s. sq. epithelium [mesothelium].

Changes at the Gastro-oesophageal Junction:

1. The stratified squamous epith. of oesophagus $\rightarrow$ simple col. at stomach

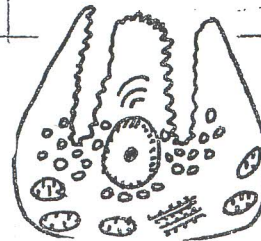
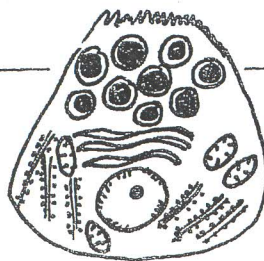
2. appearance of fundic glands.

3. Oesophageal glands in submucosa disappear.

4. the musculosa becomes thicker & formed of 3 layers $\left\{ \begin{array}{l} \text{inner oblique} \\ \text{middle circ} \\ \text{out. long.} \end{array} \right.$

Cells Lining Mucosa of Fundus & Body

	1. Mucous Surface cells 	3. Mucous Neck Cells 	2. Undiff. Stem Cells 	4. Peptic = Chief = Central cells	5. Parietal or Oxyntic Cells 	6. Entero-endocrine. Argentaffin or APUD 
Location	- surface, pit. v - isthmus //	- Neck	regenerative cells - pit. v - isthmus // - neck (mainly)	- most numerous cell - in base.	→ isthmus // → neck // → base (few)	- base (body) DINES
Structure	- tall Col. cell e' basal oval N. - Apex is vacuolated due to dissolved mucin (stain red e' PAS)	- low col. cell e' basal flat N. the whole cytopl. appears vacuolated (foamy) red e' PAS	- low col. cell e' basal oval N.	- Δ cell e' basal rounded N. - basal basophilic cytopl. - apical pale zymogen granules.	- Δ or rounded cell e' central rounded N. - base is adherent to b.m. but apex doesn't reach surface, so, called parietal. - C: deeply acidophilic	- Col. cell e' apical rounded N. - basal granules stained e' Ag - So, called argentaffin cells.
Organelles	- r.ER, mit., well developed G.A. (supranuclear) + - apical mucin granules.	- basal r.ER. - supranuclear G.A. - apical mucin granules.	- prominent nucleoli, - polysomes - few organelles	- apical short microvilli - apical electron dense granules + lysosomes - basal r.ER, G.A. (supranuclear) - Euchromatic N. e' - clear nucleolus.	- Intracellular Canaliculi - lined e' numerous microvilli - mit., s-ER, some r.ER, small G.A.	- N. e' prom. nucleolus. - many r.ER & mit. - Infranuclear G.A. - basal dense granules. - few apical microvilli to monitor contents of gastric lumen.
Functions	- Secrete Neutral mucous → cover Surface → lubrication & protection from • autodigestion. • ulceration. by Hcl & enzs.	- Secrete acidic mucous to protect against Hcl.	Renewal of other cells: proliferate → differentiate → migrate Upwards → sup. epith. - downwards → peptic & parietal cells.	Secrete Gastric enzymes • rennin • pepsinogen → pepsin • lipase	→ Synthesis of Hcl Carbonic anhydrase in SER → $H^+ + Cl^-$ → Hcl in canaliculi ∴ cytopl. has normal pH - Secrete intrinsic factor for abs. of vit. B12.	Secrete hrs: 5 types: 1. G-cells → gastrin → stim Hcl secret 2. E.G. → glucagon → ↑↑ bl. sugar (α-cells) 3. E-cells → endorphin → pain killer 4. D. → somatostatin → anti G.H. 5. E.C. → serotonin → vasoconstrict



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- | Fundus | Pylorus |
|--|--|
| <p>Mucosa - thick, dark & highly folded.</p> <ul style="list-style-type: none"> - contains <u>Fundic glands</u>. • crowded, occupy most of the thickness of the mucosa. • Simple branched tubular gl. • perpendicular to the surface • <u>pits</u>: narrow & short. ($\frac{1}{4}$-$\frac{1}{3}$ of gland length) • lined e' surface mucous, mucous neck cells, stem cells, peptic, parietal & APUD cells. - minimal c.t. bet. the glands. | <ul style="list-style-type: none"> - thin, pale & less folded. - contains <u>pyloric glands</u>. • less crowded, occupy $\frac{1}{2}$ the thickness of mucosa. • Simple branched coiled tubular. • not $\perp$ surface. • <u>pit</u>: wider & deeper ($\frac{1}{2}$ length of gland) • lined e' surface, mucous, stem, few APUD, occasional parietal cells. No peptic cells. - abundant c.t. bet. the glands. |
| <p>Submucosa: wider</p> | <p>- narrower.</p> |
| <p>Musculosa: Thinner</p> <ul style="list-style-type: none"> - 3 layers $\rightarrow$ inner oblique $\rightarrow$ middle circular $\rightarrow$ Out. long. | <p>- Thicker</p> <ul style="list-style-type: none"> - 2 layers: inner circ: thick $\rightarrow$ pyloric sphincter $\rightarrow$ Out. long. |

Changes at rectoanal Junction:

1. S.col. epith. e' goblet cells [at rectum] → st.col. at columns of Morgagni
→ st. sq. (non-kerat.) at anal valve → skin at anus.
2. muscularis mucosa splits at columns of Morgagni then disappear so
c.t. core of anal canal is continuous e' submucosa of rectum.
3. the inner circ. L. of rectum is thickened → int. sphincter.
4. " Outer long " " is thinned & pass bet. int. & ext. sphincter

The Pharynx

• It conducts air to the larynx (resp. t) & food to oesophagus (GIT)

• Formed of :

1] Mucosa :

- ② epith. :
- a. Nasopharynx : resp. epith. = ps. str. col. cil. e' goblet cells.
 - b. Oropharynx : oral mucosa = Non-Keratinized st. sq. epith.
 - c. laryngeal " : " " " " " " "

③ lamina propria : contains mucous glands.

④ No muscularis mucosa but dense fibrous c.t. rich in elastic fibre

2] Musculosa : inner longitudinal & out. oblique skeletal m's

Barrett esophagus:

Esophagus

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Metaplastic changes in the st. sq. epith of the esophagus caused by reflux of HCl to the lower end " " " (poorly protected by the esophageal glands).

Peptic Ulcer:

Stomach

Erosion of the mucosa of stomach or duodenum by HCl.

Pernicious anemia

the most common cause of vit. B₁₂ ^{deficiency} is lack of intrinsic factor.

Causes:

1. Autoimmune disease → destruction of gastric mucosa → Achlorhydria
2. Gastrectomy [Partial or total], chronic or recurrent peptic ulcer e' ↓↓ intrinsic factor.

3. long term use of drugs used in ttt of peptic ulcer as Histamine H₂-receptor antagonist: Zantac [Ranitidine] & Tagamet [Cimetidine] → suppress both HCl & intrinsic factor.

Recently: proton-pump inhibitors e.g. Omeprazole suppress HCl but do not affect the intrinsic factor.

Intestine

Zollinger-Ellison-Syndrome [Gastrinomas]

Tumor of G-cells of duodenum or pancreatic islet →

↑↑ gastrin → ↑↑ HCl → gastric & duodenal ulcers.

So, patients e' severe ulcerations of stomach & intestine & not responding to ttt. should be suspected to have a tumour e' excess gastrin.

Hemorrhoids [Piles]:

Veins in the lamina propria w become dilated, congested & protrude from the anus → painful defecation & accompanied e' fresh blood.

Small Intestine

The surface area for absorption is augmented by:

1. 6 meters long.
2. Plicae Circularis = circular mucosal folds ↑ surface area 3 folds.
3. Intestinal Villi = ↑↑ surface area 10 folds.
4. Microvilli = " " " 20 folds.

Structure of small Intestine (duodenum)

Formed of 4 layers:

I. Mucosa:

Have finger like projection [Villi] & invaginations into c.t. core [crypts]

• Intestinal villi

- projections of intestinal mucosa

to ↑↑ surface area for absorption

= C.T. core & central lymph. vs. Central Lacteal

Covered e' epith. e' 3 types of cells:

1. S. col. absorbing cells.

2. goblet cells

3. Argentaffin cells [entero. endocrine]

• Intestinal crypt [of Lieberkühn]

- invagination from surface

= simple tubular glands surrounded by c.t.

lined e' 6 types of cells:

1. simple col. absorbing cells.

2. goblet cells.

3. Entero-endocrine cells.

4. undifferentiated col. (stem) cells

5. Paneth cells 6. M. cells.

a. Epith = Cells lining the intestinal Mucosa: look the table

b. C.T. Corium = Lamina propria:

loose c.t. form the core of villi & surround the crypts, rich in bl. vs, nerves & lymph vessels = central lacteal. + WBCs + macrophages + plasma cells

In the ileum there are lymph follicles called Peyer's patches.

c. Muscularis mucosa: thin muscle: inner circular & outer longitudinal ls.

II Submucosa:

loose c.t. rich in bl. vs, lymph vessels & Meissner's plexus of nerves.

- In duodenum: contains Brunner's glands = compound tubulo-alveolar mucous glands in submucosa of 1st part of duodenum, open by long ducts in base of crypts.

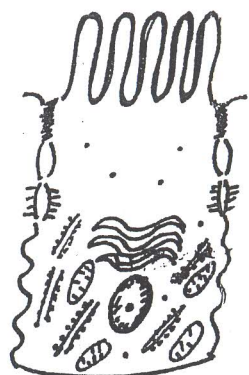
- In Ileum: contains Peyer's patches: lymph follicles at the antimesenteric side. of submucosa, pierce the muscularis mucosa & appear in muc. (villi over them either short or absent)

III. Musculosa:

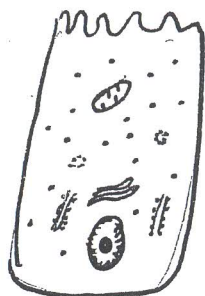
Smooth muscles arranged as Inner circ. & outer long. layers separated by Auerbach's plexus of nerves.

IV. Serosa: loose areolar c.t. covered e' s. sq. mesothelium.

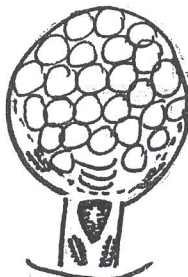
Cells lining Mucosa of Small Intestine



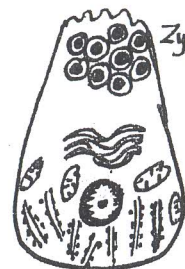
① Col. abs. Cell [Enterocyte]



② Undifferentiated Col. cells



③ Goblet Cells



④ Paneth Cells

Zymogen grs.

⑤ M cells microfold cells



⑥ Argentaffin cells Entero-endocrine "APUD" cells.

Site	① Col. abs. Cell [Enterocyte]	② Undifferentiated Col. cells	③ Goblet Cells	④ Paneth Cells	⑤ M cells microfold cells	⑥ Argentaffin cells Entero-endocrine "APUD" cells.
L.M.	- Villi & crypts - tall col. cell e' basal oval N. & apical acidophilic striated border.	- crypts. - short col. cell e' basal oval N. many cells show mitosis	- Villi & crypts (bet. enterocytes) - basal cylindrical part e' dark Δ N - apical clear flask-shaped part.	- base of crypt of 2 intestinal - Δ cell e' basal rounded N. - basal basophilic cyt. & apical acidophilic zymogen grs.	- crypts over Peyer's patches - modified squamous cells.	- Crypt (base) + Villi (few 1%) - Col. cell e' apical round N. basal granules stained e' Ag. so called argentaffin E.M.
E.M.	- Apical microvilli w ↑ surface area for absorpt. - Cell coat (glycocalyx) rich in enzs e.g. sucrase, isomaltase & alk. phosphatase. - The lat. borders show interdigitations & junctional complexes: Zonula occludens, adherens & desmosomes. - Cytopl: rich in mit., G.A., rER & few free ribosomes	- Smooth lat. wall e' no interdigitations - few rER & mit - small G.A. - many free ribosomes & polysomes.	- Apical pale mucous containing granules - some mit. - supranuclear G.A. - abundant r.ER in the basal & lat. part.	- basal // cisternae of r.ER, mit. - supranuclear G.A. - apical electron dense zymogen granules + lysosomes	- Function Antigen presenting Cells: phagocytose & transport antigens in intestinal lumen to underlying lymphocytes	- mit., r.ER, polysomes - Infranuclear G.A. - basal dense grs. - apical microvilli to monitor intest. contents.
functions	1. Complete digestion of ptns & CHO by enzs in glycocalyx. 2. Absorption of glucose, a.a.s, F.A & monoglycerides.	- Stem cell for other cells. [Cells of villi are renewed every 5-7 days]	Unicellular Gl. secrete mucous at intervals for [protection & lubrication] MN ^o from duod. to ileum ??	Secrete: • Intestinal enzs & • lysozyme (anti-bact)		F. → Intestinal hrs. 1. G. cells → gastrin 2. E.G. " → enteroglucagon (α cells) 3. E. cells → endorphin. (pain killer) 4. D. cells → Somatostatin 5. E.C. cells → serotonin 6. S. cells → secretin 7. Mo. cells → motilin. 8. N. cells → neurotensin. 9. I. cells → Cholecystokinin-pancreozymin 10. K. cells → Gastric inhibitory peptide

Large Intestine

Formed of: Cecum, colon [ascending, transverse, descending & sigmoid] & rectum. The appendix projects from cecum. Large intest opens to exterior by the anal canal.

Cecum & Colon

Histologically, have the same structure: Formed of:

I. Mucosa:

- No villi but only deep & wide crypts:

(a) Epith.:

- the surface is covered e' col. absorbing cells (e' striated border) + goblet cells
- Crypts are lined e' col. absorbing cells, numerous goblet cells, basal stem cells, few argentaffin cells but **No Paneth cells**.

(b) C. t. corium = lamina propria = c. t. containing solitary lymph follicles

(b) Muscularis mucosa: inner circular layer & out. long. l. of smooth muscle

II. Submucosa:

C. t. rich in bl. vs, ns, lymph vs but no glands.

III. Musculosa:

The inner circular layer is continuous while the out. long. layer is not but arranged in 3 bundles called **Tenia Coli**.

IV. Serosa:

C. t. rich in fat cells forming projections covered e' peritoneum (s. sq.) called **appendices epiploicae**

Vermiform Appendix (2-8 cm)

project from the cecum. has narrow lumen formed of:

I. Mucosa: No villi only few & short crypts:

(a) Epith.: Col. absorbing, goblet cells, stem cells, argentaffin + M-cell

(b) lamina propria: c. t. corium e' lymph follicles w extend to submucosa

(c) No muscularis mucosa: so mucosa is continuous e' submucosa

II. Musculosa: very thin: inner circular & out. long (continuous i.e. **No Tenia Coli**)

III. Serosa: c. t. covered e' s. sq. mesothelium (no appendices)

Rectum (12 cm)

Similar to Colon but fewer & deeper crypts e' more goblet cells
No tenia coli. No peritoneum. So serosa is replaced by adventitia

Differences bet. the 3 segments of small Intestine

	Duodenum	Jejunum	Ileum
Length	- 25 cm	- 2.5 meters	- 3.5 meters.
Villi	- long & broad (leaf-like) - numerous	- shorter & (tongue-shaped) - less numerous	- short & slender (finger-like) - least numerous.
Goblet cells	- few	- more	- most numerous.
Submucosa	- Contains Brunner's glands	- Neither Brunner's glands nor Peyer's patches	- Peyer's patches.

Changes at pyloro-duodenal Junction:

1. appearance of villi in the duodenum.
2. Columnar cells acquire brush border (microvilli)
3. appearance of goblet cells.
4. pyloric glands are replaced by intestinal crypts
5. appearance of Brunner's glands in submucosa of duodenum
6. musculosa become thinner in duodenum.

Small Intestine	Large Intestine
length - About 6 meters	- 180 cm
diameter - small	- larger
segments - duodenum, jejunum, & ileum	- Cecum, colon, rectum
<u>Mucosa</u> - villi & crypts	- No villi, only crypts (deeper)
cells col. absorbing, goblet, stem, M-cells & paneth cells, APU: D cells	- more goblet cells
c.t. contains WBCs, lymphocytes & plasma cells bet. crypts	- No paneth cells.
<u>Submucosa</u> : have Brunner's gls in duodenum. & Peyer's patches in ileum.	- contains solitary lymph follicles + diffuse lymphocytes bet. crypts
<u>Musculosa</u> Inn. circ. & Out. long. } continuous	- Neither Brunner's gls, nor Peyer's patches.
<u>Serosa</u> : = c.t. & s.sq. mesothelium.	- Out. long. is in 3 bundles → Tenia Coli.
	- Accumulation of fat cells → appendices epiploicae.

Anal Canal [3-4 cm]

- the few crypts start to disappear
- **Mucosa**: have long. folds = Columns of Morgagni w join at their ends → anal valves separated by anal sinuses.
- lined e' simple col. (2cm) → st. col. at Columns of Morgagni → non-kerat. st.sq. at anal valve → skin at anus. e' sebaceous & sweat glands + perianal apocrine sweat glands.
- the lamina propria contains plexus of veins that may show varicosity, become distended e' blood & dilated & bulge from the anus → piles [hemorrhoids]
- Muscularis mucosa splits then disappear.
- **Musculosa**: Inner circular & Out. long.
 - the inner circular is thickened → internal sphincter
 - the out. long. is thinned & pass bet. the int. & ext. sphincters
 - the levator ani [skeletal ms of pelvis] form ext. sphincter.